DVD for “Not-so” Dummies
Your DVD Technical Reference Guide

January 2001
Technicolor has evolved as the number one processor of motion picture film to become the world’s largest manufacturer and distributor of pre-recorded videocassettes and a leading global replicator of optical media including DVD, DVD-ROM, CD and CD-ROM.

Offering worldwide manufacturing and distribution capabilities, Technicolor’s Home Entertainment Services serves an international base of customers with its facilities in California, Michigan, Tennessee, Virginia, Canada, Mexico, Denmark, Holland, Italy, Spain, Luxembourg and the United Kingdom.
Part 1:

DVD

A Description of the Technology
How Does a DVD Differ from a CD?

- A DVD looks like a CD
- A DVD is two “half-discs” bonded together
- A DVD contains data on one or both sides
- A DVD has a “dual-layer” feature
- 1 DVD disc has 1-4 data “layers”
- A DVD has 7-25x the capacity of a CD
- DVD data read-rate is 8-9x faster than CD-ROM
- DVD players play CDs
5 DVD Disc Types

The DVD formats are documented in a group of five books:

Pre-recorded formats
- Book A: DVD-ROM Specification
- Book B: DVD-Video Specification
- Book C: DVD-Audio Specification

Recordable formats
- Book D: DVD-R Specification (write-once)
- Book E: DVD-RAM Specification (erasable)
Storage Capacity of DVD

Note: A CD is 0.7 Gbytes

Pre-recorded DVD
- DVD-5 4.7 Gbytes (1 side, 1 layer)
- DVD-9 8.5 Gbytes (1 side, 2 layers)
- DVD-10 9.4 Gbytes (2 sides, 1 layer)
- DVD-18 17.0 Gbytes (2 sides, 2 layers)

Recordable DVD
- DVD-R = 4.7 Gbytes (billion bytes) per side
- DVD-RAM = 4.7 Gbytes per side
- DVD-RW
- DVD-R+W
• DVDs are similar in principle to CDs. A DVD’s pit length and track spacing are both reduced such that a DVD contains about four times as many pits in the same area as a CD

• DVDs embrace the concept of a two-sided disc and two data layers accessible from one side of a disc

• A DVD is like a “quad-density” CD

• All DVD players play CDs
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<td>1.2 mm</td>
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<td>Two bonded 0.6 mm substrates</td>
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<td>1 or 2</td>
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<tr>
<td>Data Sides</td>
<td>1</td>
<td>1 or 2</td>
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<tr>
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<td>650 MBytes</td>
<td>4.7 - 17.0 GBytes</td>
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DVD-9: Dual-Layer Technology

DVD 5
Single Sided, Single Layer
4.7 GB, 133 minutes playback

DVD 9
Single Sided, Double Layer
8.5 GB, 241 minutes playback

DVD 10
Double Sided, Double Layer
9.4 GB, 266 minutes playback

DVD 18
Double Sided, Double Layer
17 GB, 482 minutes playback
- DVD is the first optical disc to feature two data layers read from the same side of the disc
- DVD-9 allows four hours of video on one side of the disc
- There is no need to change or flip discs
- All DVD players are able to play DVD-9
- DVD-9 allows two separate programs (one on each layer) or continuous play feature with a seamless “jump” from one layer to the next
- A DVD-9 DVD-ROM is a single-sided, dual-layer 8.5GB volume disc
DVD-9 features two data layers (Layer 0 and Layer 1) read from same side of the disc. Second or top disc layer (Layer 1) may be read in one of two modes

- Parallel Track Path (PTP) same as normal data layer Player head skips back to inner radius to read Layer 1
- Opposite Track Path (OTP). Layer 1 is read in the opposite direction to the first data layer, Layer 0

Many DVD-9 movie discs are authored as OTP such that the DVD-Video player “jumps” layers at outer disc radius to provide continuous play

- OTP often referred to as Reverse Spiral Dual Layer (RSDL)
Why is DVD-9 Everyone’s Favorite Disc?

- It looks like a CD and a DVD5 but has 8.5GB of data capacity
- It allows bit rates to be raised for higher video quality
- It allows the majority of movies to have a widescreen and 4:3 version on the same disc
- It can have 5-color picture-disc labels
- You don’t have to flip it over
- You always put it in the player the right way up… You have room for extra languages, subtitles, DTS, special features, trailers
- It can hold up to 4 hours of high quality DVD-Video to accommodate virtually all movies
What is DVD-18?

- The highest data capacity DVD disc - 17 billion bytes
- DVD gets its name from the concept of being two bonded dual-layer DVD-9 discs
- DVD-18 features 4 data layers
  - 2 layers on A-side
  - 2 layers on B-side
- DVD-18 is same thickness as a single DVD-5 or DVD-9
- DVD-18 can be thought of as the dual-layer version of DVD-10
Pros:

• Data Capacity - 17GB
• 8 hours of video per disc
• Allows 4:3 and 16:9 versions of DVD-9 titles on same disc
• Allows high bit rate for longest movies
• Allows extra bonus features to be added
• Eliminates the need for 2-disc set
• Compatible with all existing players (player sees disc same way as DVD-9)

Cons:

• Can’t print on the top data surface
• Disc needs to be manually flipped to play Side B
How to Make a DVD-18

• Step 1: Make two DVD-9 discs
• Step 2: Mold the top layer or half-disc of each DVD-9 with PMMA (perspex) rather than the regular polycarbonate material
  − Note: the PMMA disc strips clear away from the bottom disc leaving both data layers attached to the bottom disc
• Step 3: “peel off” the top layer disc from each DVD-9 and discard
• Step 4: bond the two “bottom-layer” discs together

DVD-18 will be more expensive to manufacture than two DVD-9 discs, but may have economies related to reduced packaging requirements.
Digital Video Quality
- Up to 4 hours of studio quality MPEG-2 video on one side of a CD-sized disc

Digital Audio Quality
- CD-quality sound or optional 5.1 channel digital surround sound

Interactivity and User Features
- Advanced interactivity and control through menus, chapters, feature buttons, etc...
DVD-Video Specification features:

- 1 video stream with up to 4 user-selectable angles
- 8 audio streams for multiple languages soundtracks on same disc
- 32 sub-picture streams
DVD-Video offers several unique publishing options:

- 4:3 and 16:9 “widescreen” version discs
- Regional coding. Players are world region specific; discs can be produced to play only in selected world regions for sequential title release
- NTSC and PAL versions
- Multiple angles/alternative simultaneous storylining
- Parental lock feature
Digital Copy Protection (CSS):
  • CSS - a new DVD licensed technology provided by the DVD Forum for DVD-Video

Analog Video Copy Protection (Macrovision):
  • Alters the unseen part of a video signal such that a VCR may not record a video signal
  • 3 “flavors”
    – Automatic Gain Control
    – 2-line color stripe
    – 4-line color stripe
CSS “Content Scramble System”

DVD-Video technology includes digital “CSS” (Content Scramble System) copy protection, or encryption, applied during the glass mastering stage.

- Only CSS-licensed disc manufacturers can encrypt a DVD-Video disc with CSS
- No disc-to-disc digital copying is possible
- Disc is encrypted using software keys supplied by CSS Interim Licensing Organization
- The DVD disc is a scrambled version of the original video data supplied on the master tape
DVD-Video supports normal, pan-scan and letter-box formats on both standard and wide-screen televisions.

<table>
<thead>
<tr>
<th>Recorded Data</th>
<th>Display on 4:3 TV</th>
<th>Display on 16:9 TV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
<td>Pan-Scan</td>
</tr>
<tr>
<td>4:3</td>
<td><img src="image" alt="Normal" /></td>
<td><img src="image" alt="Pan-Scan" /></td>
</tr>
<tr>
<td>16:9</td>
<td><img src="image" alt="Normal" /></td>
<td><img src="image" alt="Pan-Scan" /></td>
</tr>
</tbody>
</table>
Audio on DVD-Video Discs

DVD-Video discs **must** contain

- Either
  - PCM 48kHz stereo (very rare due to data requirements)
- Or
  - 2-channel Dolby Digital (NTSC regions)
  - 2-channel Dolby Digital or MPEG-2 audio (PAL regions)

DVD-Video discs **can also** contain at content providers option

- 5.1 channel Dolby Digital surround sound
- 5.1 channel DTS surround sound
- 5.1 channel MPEG-2 surround sound
DVD-Video 5.1
Channel Surround Sound

- Left Front
- Center
- Right Front
- Sub-Woofer
- Left Rear
- Right Rear
What is Dolby Digital?

- Dolby Digital (sometimes referred to as Dolby AC-3) is the specified NTSC version compressed digital audio standard for DVD-Video. (AC-3 3rd generation Audio Coding Algorithm)
- DD is available in 2-channel stereo or 5.1-channel surround sound (The 0.1 channel is the sixth channel which is low-bandwidth sub-woofer)
- Introduced in 1992 theatrically for Batman Returns and now the de facto standard for surround sound in movies and HDTV
- A complete 5.1 channel surround sound uses approximately 25% the data of a stereo CD
- 5.1-channel DD requires a digital decoder on DVD player or amplifier
What is DTS?

- Digital Theater Surround
- An optional and alternative surround sound system to Dolby Digital 5.1 for DVD-Video
- Requires DTS decoder in DVD player or receiver
- Higher fidelity, higher bandwidth than DD 5.1
- Uses nearly 4x the data capacity of Dolby Digital
- Due to data capacity required it is unlikely DVD discs will contain both DTS and DD 5.1
- DTS is currently in a small minority of titles compared to DD 5.1
Next generation CD-ROM disc

- 4.7-17 GB capacity
- UDF and ISO 9660 File System
- 9X data read-rate of CD-ROM drive
- Drives fully backward compatible with all CD formats
- The storage medium that will bring studio quality video to the PC
• DVD-ROM uses a micro UDF/ISO 9660 bridge file system
• UDF is the standard DVD file system
• UDF is designed to incorporate writeable and re-writeable discs
• ISO 9660 bridge provides backward compatibility until computer operating systems support UDF and authoring tools become widely available
All user data is 100% verified to the incoming master DLT (Digital Linear Tape).

Current Exception! CSS Encrypted Titles

• CSS copy-protected titles (DVD-Video) - The CSS encryption process is conducted during the data transfer from DLT to glass master, therefore the DLT and disc contain different data

• CSS-licensed workstations that can encrypt the DLT for direct comparison to disc or vice-versa are expected to be available in late 1999
• Specification Published March 1999
• High-quality 2-channel and multi-channel options
• 16-, 20-, 24- bit quantization options
• 48/96/192 kHz and 44.1/88.2/176.4 kHz sampling frequency options
• Maximum of 6 channels
• Highest resolution (stereo) is 192kHz/24-bits which gives a playtime of 64 minutes on a DVD-5 (Note: CD is 44.1kHz/16-bits or 15% of the data usage of DVD-Audio hi-res)
• Requires DVD-Audio players (avail. 3Q Y2k) or announced combi-players (DVD-Video and DVD-Audio capable)
What is Super-Audio CD (SACD)?

• This is not a DVD!!
• Developed and licensed by Sony and Philips using dual-layer technology
• Construction is similar to DVD-9
  – Bottom layer is high density data layer with semi-reflective coating
  – Top layer is standard CD w/ data surface on outside of CD
• High density layer only plays in a SACD player
• CD layer plays in all CD-Audio devices
• SACD layer features Sony DSD (direct stream digital) encoding technology
• Stereo and multi-channel high resolution format
Is a Disc w/ One DVD Layer and One CD Layer Possible?

Theory:

- Build a DVD-9 disc with the gold layer as DVD in the center of the bonded disc
- Make the top half of the DVD-9 a CD data layer and “flip” it so the CD data is on the outside surface of the disc
- Both CD and DVD layer should read from bottom of disc

Practice:

- DVD player firmware may see the CD layer and ignore the DVD layer such that DVD won’t play
- DVD player firmware may see low reflectance layer DVD and reject disc if two separate DVD layers not found
- CD players may not play CD layer if reflectance is diminished
- It can and does work on SOME players, but the disc is NOT a legal format and no titles have been published as such
The Recordable DVD Formats

DVD-R
- 3.9GB and 4.7GB record-once disc launched 1997 by DVD Forum

DVD-RW
- launched 1999 by DVD Forum, a rewriteable 4.7GB disc

DVD-RAM
- 2.6GB version launched by DVD Forum 1997 (requires caddy)
- 4.7GB version forthcoming

DVD R+W
- Not yet available, developed by HP, Sony, Philips
- 3GB rewriteable disc with no caddy

No dual-layer implementations for any of the above
Part 2:

Manufacturing a DVD Disc
The 10 Steps to Make a DVD

1. Collect, create and capture video, audio, data assets
2. Video and audio data compression
3. Title authoring to DVD spec
4. Data and file formatting to DVD file system
5. Create master DLT with DDP (Disc Description Protocol) file for disc manufacturing
6. Glass mastering
7. Test mold and verify DLT / program authoring
8. Replication... molding / metalization
9. Bonding, printing and final QC
10. Packaging and distribution
DVD-Video titles are a collection of separately prepared “assets” that are “authored” into a multiplexed DVD disc image.

- Video
- Audio
- Extra language soundtracks
- Subtitles, sub-picture information
- Menus, stills, titles, chapters, interactivity

Control and preparation of assets is the key to successful DVD-Video title creation.
AUDIO & VIDEO COMPRESSION

The process of converting digital audio and video masters to computer data files of greatly reduced size. This is a specialty of video post houses and major multimedia developers who have invested $$$ in the video and audio recording resources. The compression process affects the final video picture quality.

DVD AUTHORING

The process of creating a DVD master tape or disc image that complies to the DVD specifications from the various data and compressed video/audio input media that a client may supply. Performed on a powerful workstation manipulating “data assets.”
Video Compression

- DVD-Video features MPEG-2 compressed video
- DVD introduces VBR (Variable Bit Rate) encoding where the amount of data used per frame is varied to meet the demands of the source video
- Compression algorithms and selected user bit rates determine picture quality
- “Garbage-in, garbage-out” process -- the final picture quality is highly dependent on picture quality of source material
• Creating a DVD disc image that can be transferred to DLT for glass mastering
• Performed on modern digital PC workstations with DVD authoring software
• Designs in interactivity for the DVD title
• Presents the movie or video in a fashion that maximizes the entertainment value by using the interactive features of DVD players (e.g., menus, multiple camera angles, subtitles and languages)
• Authoring allows a publisher to add value to their assets by providing features not possible with VHS, laserdisc, etc...
Technicolor provides the following services:

- Creation of DVD-ROM disc images on authoring workstations
- File formatting to UDF file system
- Creation of master DLT with DDP encoding “ready-to-master”
- Porting CD-ROM titles directly to DVD
• DVD is usually mastered from a DLT (Digital Linear Tape), a well-established SCSI tape medium

• Technicolor requires a compact DLT type III/IV with DDP 2.0 encoding (Disc Description Protocol). This has become the de facto mastering standard for DVD

• All widely-available DVD-Video authoring systems output master DLTs which are ready for manufacturing at the disc plant

• Unlike the CD format, a DVD or DVD-R is not always suitable as a source for disc mastering (Notably CSS titles)
Why is DVD Harder to Make Than CD?

- New technological challenges, new 1st generation solutions for DVD versus 15 years of process development in CD
- 4x as many pits on the same surface
- 2 data surfaces on each disc / bonding the substrates
- Dual-layer technology. New for DVD
- Molded discs half as thick but bonded disc needs to be twice as flat
- Data commonly stretched to Radius 58mm
- 1st Generation Test Equipment
Why Can’t All CD Equipment be Used to Make DVD?

- If it could, then why doesn’t every manufacturer offer DVD
- CD equipment highly developed over 15 years without reference to DVD
- No bonding process in CD manufacturing
- Mastering machines designed to create features of twice the width of a DVD pit
- Upgrades to DVD Specification not engineered/supported by vendors or not cost-effective
- Changeover options from DVD back to CD are inconvenient
• DVD mastering using higher resolution laser equipment (UV, violet lasers)

• CD mastering equipment not capable of mastering DVD discs
Higher Density and Higher Definition:

- A DVD disc is by definition a replica of its Master... “bad masters make bad discs”
- 4x as many pits or features as a CD in the same area
- Shorter, narrower pits require finer focus and smaller writing spot… UV lasers
- Track pitch or spacing reduced to below half that of CD
- Need for optimum pit definition and geometry… low “jitter”
- Process is 4x more critical than CD
Why is DVD Mastering More Difficult than CD?

- Cycle Time at 20MHz Mastering is 4 times longer than CD Mastered at 4X
- 2R DVD Mastering reduces Mastering time to that of 2X CD
  - glass spins at 3800rpm versus 1200rpm
  - need to serve data from network with huge storage capacity
- Sensitivity to and specification of track pitch variations and focus
- Developing end point more critical
Is Electroforming Any More Critical for DVD?

- Top/data surface of DVD disc now very sensitive to topography for bonding/space layer considerations
- Bonding process sensitive to
  - flash in vertical plane on data side
  - disc thickness variation
  - disc taper
- Replication process (jitter, tilt) for DVD more sensitive to process adjustment due to thickness variations
- Eccentricity of data to stamper ID more critical
- Surface roughness of metal parts more critical
The Challenge of DVD over CD
“Jitter and Tilt”

DVD discs are mechanically and physically more precise than CD:

• Mastering and Electroforming process windows are tightened to allow maximum replication process window
• DVDs must be made flat and stay flat
• Disc thickness must be more uniform
• Reduced eccentricity of track to center hole after bonding
• Bonding technology has to be optimized and integrated into replication lines to produce the flattest discs possible
• Printing options reduced by adverse effect of UV printing on disc flatness
State of-the-art injection-compression molding machines used for the ultimate pit replication, and DVD quality.
- Two presses or a twin-cavity machine required to make one disc in one cycle
- “Hotter” - Significantly different process than CD molding
- DVD Molding is a far more critical process
- Need close control of:
  - jitter
  - flatness
  - disc thickness (especially DVD-9)
  - mechanical parity between pre-bond half discs
All DVDs are bonded. This is a new technology for the CD industry.

Three early options -
Hot-melt glue bonding (opaque)
  • M-O and laserdisc proven technology
  • Single-layer applications only
UV bonding (radical) - a clear bond. 90+% of all DVD discs
  • Dual-layer application
  • Newly-developed technology
UV bonding (cationic) - opaque
  • Single-layer only, new technology
DVD-9 is uniquely characterized by the semi-reflective coating on the lower data layer and full reflective layer on the upper data layer.

Both DVD-9 layers give similar reflectivity when read by player.
DVD-9 Dual-Layer Technology

**DVD-5**
- Moulded Polycarbonate Substrate
- Adhesive
- Standard Reflector
- Premastered Pits
- Moulded Polycarbonate Substrate

**DVD-9**
- Moulded Polycarbonate Substrate
- Aluminium Full Reflector
- Adhesive
- Semi Reflector
- Premastered Pits
- Moulded Polycarbonate Substrate
What a Manufacturer Needs to Make DVD-9

- Knowledgeable engineering staff
- Thorough understanding of specification and technology
- Quality system adapted to DVD-9 requirements
- Investment in new DVD-9 manufacturing lines
- Investment in test equipment for dual-layer measurements
- Significant ramp-up and qualification period
- Process has to be reliable and consistent 24-hours a day, 7-days per week to meet CD service levels
• Thickness working range for DVD-5 0.57 - 0.63 mm
• Thickness working range for DVD-9 0.56 - 0.57 mm
  – spacer layer has to be 40-70 microns and still leave Layer 0 and spacer-layer combined less than 0.64mm
• This is the most stringent specification for molding machine manufacturers in optical disc industry
  – shot weight repeatability
  – shot weight control
  – Cpk has to be controlled
• Layer 1 discs are also molded to “match” Layer 0 discs
• Measurement accuracy issues with tight tolerance
• Not critical on DVD-5 with CD sputtering technology
• DVD-9 specification
  – uniformity 18-30% on both layers
  – 33% total variation on disc including stress effects
• Reflectivity from both layers needs to be balanced such that a player sees similar signal strength from each layer - - need a reference DVD player to verify
• Material choices
  – gold: costly, easy to process
  – silicon: cheaper, developed, proven but NOT widely implemented
  – material cost weighed against yield
• Thickness and uniformity not specified for DVD-5
• DVD-9 features rigid specifications for spacer layer
  – specification 40-70 microns
  – allowed variation +/- 10 microns on entire disc
  – allowed variation +/- 4 microns in one revolution
• Bonding material has to have good optical properties
• Dispense much more critical and sensitive to bubble formation
• Apply vital for uniformity
• Spread controls uniformity
• Bonding resin inherently forms an uneven wedge shape during spin which needs to be controlled and opposed
• Measurement of Disc Thickness to 2-3 micron accuracy to develop Cpk for Layer-0 molding process
• Measurement of reflectivity and uniformity for Layer-0
• Measurement of spacer layer thickness
• Measurement of eccentricity to higher spec especially on DVD-9
• QC testing of OTP layer jumps
• QC testing: 135 minutes per disc
• DVDs are deformed by the shrinkage of UV-cured ink
• DVD-9 discs are more susceptible to shrinkage
  – bonding layer is attached to two dissimilar metals
  – bonding layer much thicker than for DVD-5
• DVD Specifications of 0.3° tangential tilt and 0.8° degrees radial tilt need to be significantly tightened to counter aging effects and tilt changes due to UV-curing of inks
• Offset printing more “tilt-friendly” than screen although more costly and inefficient
Need new DVD player technology to test. Cannot use CD test equipment.

- In-line testing for flatness or tilt; a much tighter specification than for CD
- New tracking methods… DPD (Differential Phase Detection)
- New concept of baseline jitter to measure pit consistency
- Need for reference players (e.g., Pulstec DDU-1000) and reference discs
- DVD testing methods have to cater for the DVD players 635nm player wavelength
- DVD-9 space-layer, semi-reflective layer testing
DVD Environmental Testing

The environmental tests ensure DVDs remain playable and exhibit the same longevity as CDs.

- Storage Test / Heat Cycle Test
- 70º C / 50% RH / 96 hours
- Flatness of bonded disc more likely to alter in environmental testing
- Determine tilt angle degradation at the user end by this test and reduce the manufacturing tilt specification accordingly
Decoration / Printing Options

DVD-5. Top disc is a “dummy disc” with no data
- Pit-art (laser graphics)
- Hologram

DVD-5 and DVD-9
- Silk-screen and offset CD printing options

DVD-10 and DVD-18
- “Inner Ring” catalog band inf. only (print or etch)
- Print in clear center of disc
Pit-art is the most cost-effective DVD decoration and identification technique. It is unique to DVD and avoids the costly printing process.

Pit-art images are molded from a stamper. The customer’s artwork is printed on photographic paper as a template which is used on mastering lathes to make a pit-art master stamper.

Customer needs to supply

• .tif files or high resolution graphics files over 300 lines per inch, preferably 1200 lpi
• Image diameter 40mm - 118mm
• Options are identical to CD
• DVD-Video has widely adopted the VSDA-recommended form size (e.g., Amaray, Alpha)
• Automation now becoming available for DVD-Video packages
• DVD-ROM packaging gravitating to the CD packaging options and variety
• Jewel-box remains a cost-effective and durable solution
• Technicolor is able to offer any configuration
How do we make DVD production as efficient as CD is now?

- 2R (double-speed) mastering
- Molding cycle-time reduction
- Dual-cavity molding
- New materials to make flatter discs that stay flatter
- More cost-effective alternatives to gold layer
- In-line manufacturing
- Low-shrinkage inks
- Automated multi-player electronic test systems
Part 3: DVD Replication

Getting Your Discs
Made by a Disc Replicator
Industry Experience

- One of the leading suppliers of CD-ROMs worldwide
- International and independent company: multiple North American and European facilities
- Complete supply chain management, distribution and fulfillment
- Technical expertise / established reputation
  - CD-1983
  - CD-ROM - 1987
  - DVD-Video and DVD-ROM - 1996
- Annualized Capacity:
  - 500 million CDs per year
  - 150 million DVDs per year
What Your Replicator Needs to Know

Is Your Title DVD-5, DVD-9 or DVD-10?

What form is your data in?

Do you want a Check Disc Package for approval prior to replication?

How do you want the disc printed or can you use pit-art?

What packaging do you want?
What Specific DVD-Video Info is Required?

- How many video title sets are there requiring CSS encryption?
- Is the title authored to receive CSS?
- Is the DLT data:
  - 2048 (not setup for CSS)
  - 2054 incomplete (not setup for CSS)
  - 2054 complete (CSS titles need this)
  - 2064 fully-formatted
- Is DVD-9 title OTP or PTP (opposite or parallel track)?
- What sector and runtime does the layer jump occur (DVD-9 OTP titles)?
DVD-10

- Only choice for 8.5 - 9.4 GB titles
- Lower manufacturing cost
- Very limited printing options
- Consumer confused by labeling or lack of

DVD-9

- Works like an 8.5 GB CD-ROM disc
- Looks like a CD-ROM disc
- Higher cost of goods
What a Developer Needs to Supply to a Replicator

Data
- Raw unformatted data
- Fully formatted DVD Disc image

Disc Artwork
- E-files
- Label film

Packaging/Print Materials
• Is the project UDF/ISO 9660?
• Is the project MacAware?
• What’s the total byte count?
• What’s the total file count?
• Clearly define each and every supplied item of input media

• Technicolor has multiple DVD-ROM authoring/formatting packages and can accept input media on any mountable drive:
  – Scenarist II
  – DVD Gear
  – ROM Family Formatter
• DLT Type III/IV Media
• ANSI Tape Label
• DVD-ROM DLT Master Contains 3 Files
  – DDPIID
  – CONTROL.DAT
  – IMAGE.DAT / MAIN.DAT
• Digital Copy Protection for DVD-Video Spec Title Sets
• Technology approved by DVD Forum with the approval of MPAA and CPTWG
• Applies to “.VOB” files or “Video Object Units”
• CSS is developed for the benefit of and as a security enhancement for DVD-Video Media

• IT’S FREE at Technicolor!!!
How do you make a CSS Disc?

Step 1: During authoring, video sectors which require scrambling are “tagged” as such on the DLT.

Step 2: Encrypted CSS Keys are obtained by a CSS licensee; either rights owner, authoring house or disc manufacturer.

Step 3: Encryption of video occurs at disc manufacturing stage.
Check disc packages (development samples)

- Up to 20 final replicated discs includes mastering, replication, pit art and jewel case pack
- Quick turn time
- Mastering waived for production run
E-file formats accepted include Quark Xpress, Photoshop, PageMaker, Illustrator, Freehand etc.

Standard CD Film specifications

Maximum Allowable Print Areas
DVD-5  pit-art area 46-116.5mm
DVD-5/9 print area 46-116mm or 34-116mm
DVD-10  print area 39.5mm - 43.5mm
Packaging a DVD Title

- A DVD is physically the same as a CD
- A variety of packaging options, including (among others) the standard jewel box for DVD-ROM and the Amaray case, AlphaPak™ and Super Jewel Box for DVD-Video
- “A Quality Product Deserves a Quality Package”
- Replicators with automation for your chosen packaging will offer cost savings
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